



DOCKET NO. : MERCHANT 33-3-3

PATENT

GP2823

# 25 / Request  
for  
reconsideration  
11/1/02  
VS

IN THE UNITED STATES PATENT AND TRADEMARK OFFICE

In re application of:

Sailesh Merchant, *et al.*

Serial No.: 09/092,158

Filed: June 5, 1998

For: METHOD FOR THE FABRICATION OF CONTACTS IN AN  
INTEGRATED CIRCUIT DEVICE

Grp./A.U.: 2823

Examiner: Maldonado, Julio J.

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Honorable Commissioner of Patents  
Washington, D.C. 20231

I hereby certify that this correspondence is being deposited with the United States Postal Service as first class mail in an envelope addressed to: Commissioner of Patents and Trademarks, Washington, D.C. 20231, on 10-22-02 (Date)  
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(Signature of the person signing the certificate)

Sir:

REQUEST FOR RECONSIDERATION UNDER 37 C.F.R. § 1.111

In response to the Examiner's Action mailed July 29, 2002, please accept the following remarks.

REMARKS

The Applicants have carefully considered this application in connection with the Examiner's Action mailed July 29, 2002 and respectfully request reconsideration of this application in view of the following remarks.

**I. Rejection of Claims 1, 4-12, 15- 24 under 35 U.S.C. §103**

The Examiner has rejected process Claims 1, 5-6, 8-12, 16-17 and 24 under 35 U.S.C. §103(a) as being unpatentable over U.S. Patent No. 5,591,671 to Kim *et al.* ("Kim") in view of U.S. Patent No. 5,714,418 to Bai *et al.* ("Bai") and U.S. Patent No. 6,057,232 to Lee *et al.* ("Lee"). The Examiner further rejected Claims 4 and 15 under 35 U.S.C. §103(a) as being unpatentable over Kim in view of Bai, Lee and further in view of the Applicant's admitted prior art. The Examiner also rejected Claims 7 and 18 under 35 U.S.C. §103(a) as being unpatentable over Kim in view of Bai, Lee and further in view U.S. Patent No. 5,970,374 to Teo ("Teo").

The Applicants respectfully maintain that the claimed invention is not obvious in view of the foregoing references, and that these references fail to establish a *prima facie* case of obviousness.

The Applicants wish to clarify a misunderstanding regarding the Applicant's prior argument that Kim and Bai are not properly combinable. It appears that the Examiner has misconstrued this as an argument that Kim is nonanalogous art. This is not the argument that was made.

To clarify, the Applicants wish to point out that three basic criteria must be met to establish a *prima facie* case of obviousness. See M.P.E.P. ¶706.02(j). First, the prior art reference (or references when combined) must teach or suggest all the claim limitations. Next, there must be some suggestion or motivation, either in the references themselves or in the knowledge generally available to one of ordinary skill in the art, to modify the reference or to combine reference teachings. Finally, there must be a reasonable expectation of success. The teaching or suggestion to make the claimed combination and the reasonable expectation of success must both be found in the prior art, and not based on the applicant's disclosure.

As noted in a previous communication filed July 13, 2002, a person having ordinary skill in the art would not be motivated to find or add to Kim the teachings and suggestions of Bai, inasmuch as Bai does not address the problem of preventing oxidation of Kim's barrier and ohmic contact layers. Kim addresses this by depositing a refractory metal layer over the barrier and ohmic contact layers *before* heat treatment. As noted previously, Kim does this so that oxidation of the barrier layer and ohmic contact layer can be prevented, thereby preventing the deterioration of the contacting resistance property. (Column 5, Lines 17-18). Bai, however, is not concerned with the oxidation of his capturing and blocking layer. Rather, Bai wishes to cure micro defects in his barrier so that Copper atoms will not diffuse through the barrier. It follows, therefore, that one who is skilled in the art would have no motive to insert Bai's step of heat treating the barrier layers *before* depositing the metal because this step runs contrary to Kim's goal of preventing oxidation of the barrier layer and ohmic contact layer by depositing a refractory metal layer over the barrier and ohmic contact layers *before* heat treatment.

As further noted in the communication filed July 13, 2002, Bai is also not properly combined with Kim because the combination does not have a reasonable expectation of success. This follows because Bai's step of annealing the barrier layers prior to depositing the metal would allow oxidation of the barrier layer and ohmic contact layer, thereby destroying the functionality of the device disclosed in Kim.

The Applicants therefore respectfully submit that one of ordinary skill in the art would not combine Kim and Bai. Rather, the combination of Kim and Bai requires the improper use of hindsight. *See Pentec, Inc. v. Graphic Controls Corp.*, 776 F.2d 309, 227 USPQ 766 (Fed. Cir. 1985) (prior art may not be gathered with the claimed invention in mind); *In re Fine*, 837 F.2d 1071. 5

USPQ2d 1596 (Fed. Cir. 1988) (“One cannot use hindsight reconstruction to pick and choose among isolated disclosures in the prior art to deprecate the claimed invention”). Because at least two of the three basic criteria have not been met for establishing a *prima facie* case of obviousness under 35 U.S.C. §103(a), the Applicants respectfully requests the Examiner to withdraw all rejections based on the combination of Kim and Bai.

Similar arguments, also presented in the communication filed July 13, 2002, are equally applicable to the improper combination of Kim and Teo. Analogous to Bai, Teo teaches annealing prior to the deposit of a metal layer (Column 5, Lines 3-8; FIGURE 3E), which is contrary to the goal of preventing the oxidation of the barrier layers as taught by Kim. Therefore for the same reasons outlined above, the combination of Kim and Teo is improper.

Concerning the present Office Action, the Applicants take issue with the Examiner’s §103 rejection based on the combination of Lee with Kim and Bai.

First, for the reasons expressed above, the combinations of Kim and Bai or Kim and Teo are improper and should be removed.

Second, the combination of these references does not teach or suggest all the claim elements in the independent claims. For example, Lee does not teach or suggest subjecting the contact plug to a temperature sufficient to anneal the barrier layer, as recited in Claim 1. Rather, Lee teaches the formation of a passivation film over copper wiring and annealing in an inert gas atmosphere to form an intermetallic compound layer over the copper wiring. (Column 7, Lines 30-35) Also as recited in Claim 1, the barrier layer is deposited by physical vapor deposition in the contact opening. In contrast, Lee’s passivation layer is entirely outside of the opening depicted in FIGURES 6B and 6C of Lee. Moreover Lee performs an anneal with substantially portions of barrier layer 45 remaining

outside of the opening and over the insulting film 43, as depicted in FIGURE 6B, which is similar to the prior art processes depicted in FIGUREs 1A, 1B and 2 of the present application. Lee therefore does not form a contact plug, such as that presented in FIGURE 5 of the present application. As such, there is no teaching of subjecting a contact plug, as recited in Claim 1, to a temperature sufficient to anneal the barrier layer.

Third, one of ordinary skill would not be motivated to combine the teachings of Lee with Bai because Lee is directed to the formation and anneal of a double layer passivation film formed over copper wiring, and not to the curing of micro defects in Bai's barrier so that Copper atoms will not diffuse through the barrier. As noted above Bai applies his heat treatment before depositing the metal, and therefore one skilled in the art would not be motivated to apply the teaching of Lee. Moreover, Bai provides no motivation to apply thermal loads of 700°C as done by Lee (Column 6, Line 5), because when heating to 500°C for one hour are adequate to cure the capturing and blocking layers. (Column 8, Lines 65 of Bai).

In summary, the combined teachings of Kim with Bai and Lee do not teach or suggest all elements of the present invention and therefore fail to establish a *prima facie* case of obviousness with respect to independent Claim 1, as well as independent Claims 12 and 24, which contain analogous elements as Claim 1, or their respective dependent claims, under 35 U.S.C. §103(a). The Applicants therefore respectfully request the Examiner withdraw the rejection and allow Claims 1, 4-12, and 15-24.

### III. Conclusion

In view of the foregoing remarks, the Applicants now see all of the Claims currently pending in this application to be in condition for allowance and therefore earnestly solicit a Notice of Allowance for Claims 1, 4-12 and 15-24.

Attached hereto is a marked-up version of the changes made to the specification and claims by the current amendment. The attached page is captioned "**Version with markings to show changes made.**"

The Applicants request the Examiner to telephone the undersigned attorney of record at (972) 480-8800 if such would further or expedite the prosecution of the present application.

Respectfully submitted,

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